

DESIGN PRINCIPLES, REQUIREMENTS, AND SAFETY ASSESSMENT
FOR THE SAFE DISPOSITION OF MUNITIONS
(An Overview of STANAG 4518)

Growing international awareness of ecological issues and the environmental impact of industrial waste disposal processes have caused NATO member nations to examine programs and processes concerning the demilitarization and disposal of munitions. Contributors of this increased attention include more stringent international environmental legislation, the desire to preserve natural resources, the desire to reduce waste, and limited space and locations for disposal. Because legislation is likely to become more stringent in the future, plans and processes used in the demilitarization and disposal of munitions will need to be carefully crafted and be reviewed continually in the light of new legislation and advances in technology. The focus of demilitarization and disposal is escalating from using techniques that are safe, efficient and cost effective to ones that are environmentally acceptable, physically safe, free of health hazards, practical, and cost effective. Nations are being urged to move from disposal processes that rely on destruction toward those that maximize the recovery and reuse of component materials.

NATO AC/310 Sub Group IV was assigned the task of preparing a NATO Standardized Agreement (STANAG), STANAG 4518, to establish design safety principles, design safety requirements, and the assessment process for the safe disposal of munitions.

In STANAG 4518, the term "demilitarization" refers to the act of removing or otherwise neutralizing the military potential of a munition. Such neutralization is to be carried out in a safe, cost effective, practical and environmentally responsible manner. Demilitarization is a necessary step for military items prior to their release to a non-military setting. The term "disposal" refers to end-of-life (EOL) tasks and actions for residual materials resulting from demilitarization operations. Disposal encompasses the process of redistributing, transferring, donating, selling, abandoning, or destroying military munitions.

The policies of national authorities and the international agreements in effect at the time of a munition's development will determine the extent of incorporation of demilitarization and disposal principles and plans into a munition's developmental life cycle. If the national ordnance safety authority of the developing nation approves a munition for service use (in keeping with national environmental legislation) even though a plan has not been developed that meets the intent of STANAG 4518, that review authority shall clearly document the basis for its approval as required by STANAG 4518.

STANAG 4518 requires that demilitarization and disposal tasks and actions be applied to munitions designed for military use or taken into use by the military. Demilitarization does not include the resale of the store in an unchanged condition, other than remarking, but may include the resale of components in their original form following removal during demilitarization. It also excludes any operational task such as Explosive Ordnance Disposal (EOD) and Battlefield Area Clearance, but may apply to munitions recovered during the clearance of ranges or storage sites and subsequently brought into the munition management system. Where all or part of a munition,

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whether the subject of a demilitarization and disposal plan in accordance with STANAG 4518 or not, is used in the rework or development of another munition, the munition that emerges from the task will be considered as a new design and will be subject to the requirements of STANAG 4518.

STANAG 4518 also requires that the process of demilitarization result in the removal or neutralization of the military potential of a munition to prevent reuse, misrepresentation or misidentification of the residue for military or terrorist activities. Such actions will make the item and all its components after disassembly incapable of full or partial functioning, reuse in other weapon systems (e.g., replacement of fuzes), and will make the item or its components unidentifiable as a munition.

Figure 1 illustrates the demilitarization and disposal process.

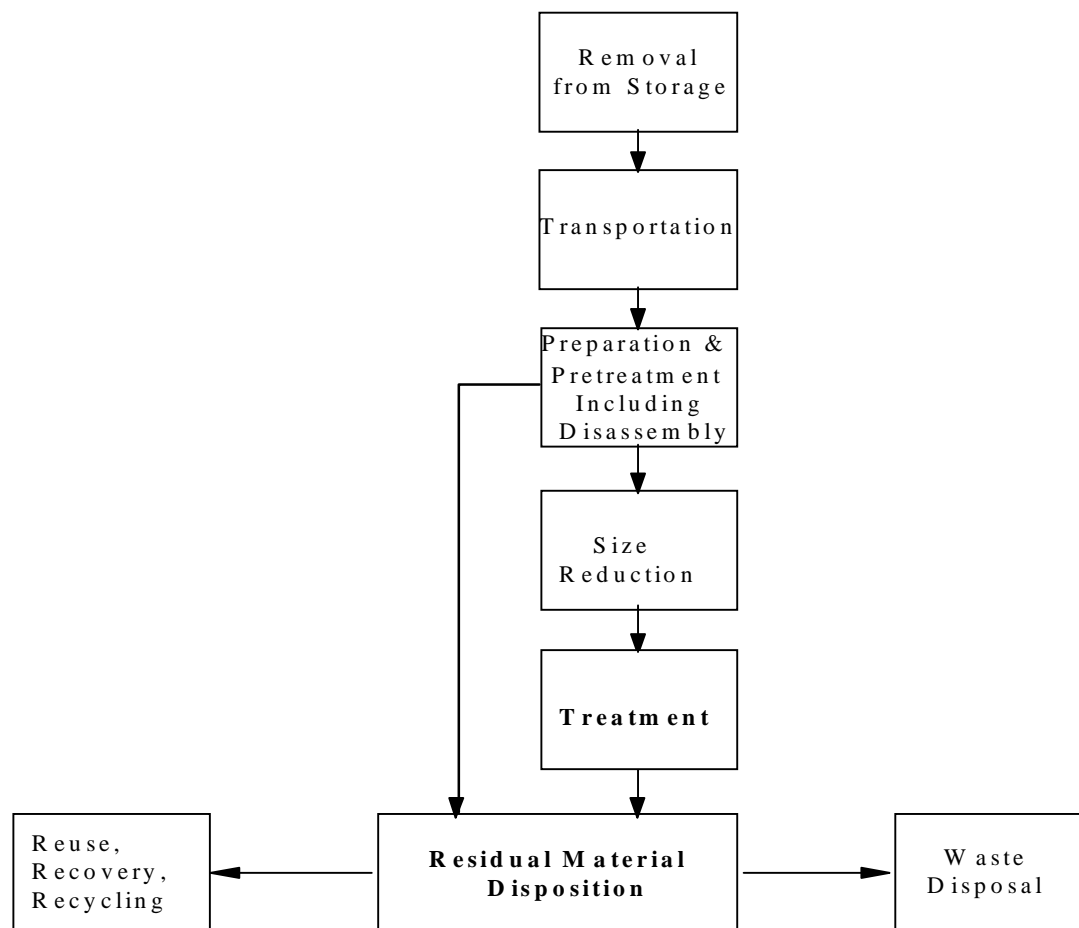


Figure 1. Demilitarization and Disposal Process

STANAG 4518 requires that to the fullest extent possible, the following design safety principles should be applied during munition development to facilitate demilitarization and

disposal using processes that maximize safety and minimize health hazards, negative environmental impacts, and cost:

- a. Select materials that are not inherently toxic and that can be reused or recycled or destroyed with minimum impact on health and the environment at the end of the munition's life.
- b. Select materials and design features that will minimize the adverse impact of credible service-life environments and aging on demilitarization and disposal processes and by-products.
- c. Select materials and design features that allow old operable stocks to be consumed in training.
- d. Configure munitions for safe disassembly and ease of useful material recovery.
- e. Configure munitions for ease of component and package re-use or re-cycling.
- f. Design munitions to maximize service life.
- g. Design munitions to permit significant life extension modifications, and consequently, reduce the need for demilitarization and disposal.
- h. Design for ease of alternative munition applications with limited remanufacturing.

Allied Ordnance Publication (AOP), AOP-15, Guidance on the Assessment of the Safety and Suitability for Service of Non-Nuclear Munitions for NATO Armed Forces, calls for the assessment of the disposal aspects of a munition as part of the overall safety assessment process. STANAG 4518 requires that during munition development, the following assessment principles be used to evaluate proposed demilitarization and disposal design features, processes and plans:

- a. Compare the munition design with the demilitarization and disposal design safety principles as stated above.
- b. If conformity with those requirements is lacking, assess the risks involved. If those risks are unacceptable, the design should be changed. Acceptability must be agreed upon by the national military safety authority. Testing may be required to gain adequate confidence in the assessment.
- c. Confirm the effectiveness of selected processes by test and analysis.
- d. Assess the chosen demilitarization and disposal procedures and EOL actions with regard to personnel safety, environmental consequences, and other substantial risks. The effects of exposure to credible life-cycle environments, of munition degradation and aging, and of environmental factors and human errors during execution of the demilitarization and disposal processes shall be taken into account when making the assessment.
- e. Assess the compatibility of the demilitarization and disposal procedures with national and international legislation regarding health, safety, and environmental protection.

STANAG 4518 was not intended to provide details of how or which techniques are to be implemented. Possible size reduction techniques are mechanical sectioning, laser grooving/cutting, cryogenic processes, washout, meltout, and water jet cutting. Methods of treatment might include open burning/open detonation (OB/OD), incineration, oxidation, biochemical or chemical decontamination, photocatalytic neutralization, bio-degradation, chemical

conversion, electrochemical reduction, molten salt destruction, open-pit burning, closed detonation, or other environmentally and safety-approved methods that remove the military advantage. After treatment, the residual material must be recovered, reclaimed, reused, recycled, sold, or be treated as waste. Because national policies will determine the acceptability of the selected method, a purchasing nation may require the use of a different method than the one accepted in the developing nation.

STANAG 4518 requires that new and modified munition development programs prepare a demilitarization and disposal plan and should include the following information:

- a. A functional and physical description of the munition (including quantity), its packaging configuration, and the equipment, processes and procedures planned for safe and environmentally acceptable demilitarization and disposal.
- b. A listing of all materials including the hazardous materials contained in the munition and their associated hazards.
- c. An indication of intent to conduct a hazard analysis on the demilitarization and disposal procedures and EOL actions in accordance with AOP-15 and to include a discussion of the safety and environmental impacts and their associated hazards.
- d. Provisions to ensure that, after application of the selected processes, all sensitive materials and items will be neutralized or otherwise be rendered inoffensive or extracted for other uses.
- e. The intended destination of liberated hazardous materials.

When STANAG 4518 is ratified, NATO nations will have agreed to apply the principles, requirements, and processes to new developments, existing stores subject to major modifications, rework, change, or addition of any hazardous component, replenishment purchases, and existing stores used in a new role. NATO nations will also agree to procure munitions purchased off the shelf which have been designed, or will be modified to comply with STANAG 4518. Specifically, the nation developing a munition will agree to incorporate acceptable end-of-mission (EOM), end-of-operational-life (EOOL), or end-of-life (EOL) disposal capabilities; to assess the design for its adherence to the guidance provided in STANAG 4518; and to document the EOM/EOL disposal processes to be used on the munition.